

DS3658 Quad High Current Peripheral Driver

Check for Samples: [DS3658](#)

FEATURES

- **Single Saturated Transistor Outputs**
- **Low Standby Power, 10 mW Typical**
- **High Impedance TTL Compatible Inputs**
- **Outputs May Be Tied Together for Increased Current Capacity**
- **High Output Current**
 - 600 mA Per Output
 - 2.4A Per Package
- **No Output Latch-up at 35V**
- **Low Output ON Voltage (350 mV typ @ 600 mA)**
- **High Breakdown Voltage (70V)**
- **Open Collector Outputs**
- **Output Clamp Diodes for Inductive Fly Back Protection**
- **NPN Inputs for Minimal Input Currents (1 μ A Typical)**
- **Low Operating Power**
- **Standard 5V Power Supply**
- **Power Up/Down Protection**
- **Fail Safe Operation**
- **2W Power Package**
- **Pin-for-Pin Compatible with SN75437**

APPLICATIONS

- **Relay Drivers**
- **Lamp Drivers**
- **Solenoid Drivers**
- **Hammer Drivers**
- **Stepping Motor Drivers**
- **Triac Drivers**
- **LED Drivers**
- **High Current, High Voltage Drivers**
- **Level Translators**
- **Fiber Optic LED Drivers**

DESCRIPTION

The DS3658 quad peripheral driver is designed for those applications where low operating power, high breakdown voltage, high output current and low output ON voltage are required. A unique input circuit combines TTL compatibility with high impedance. In fact, its extreme low input current allows it to be driven directly by a CMOS device.

The outputs are capable of sinking 600 mA each and offer a 70V breakdown. However, for inductive loads the output should be clamped to 35V or less to avoid latch-up during turn off (inductive fly back protection—refer to AN-213 '[SNOA610](#)'). An on-chip clamp diode capable of handling 800 mA is provided at each output for this purpose. In addition, the DS3658 incorporates circuitry that specifies glitch-free power up or down operation and a fail-safe feature which puts the output in a high impedance state when the input is open.

The PDIP package is specifically constructed to allow increased power dissipation over conventional packages. The four ground pins are directly connected to the device chip with a special cooper lead frame. When the quad driver is soldered into a PC board, the power rating of the device improves significantly.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

Connection Diagram

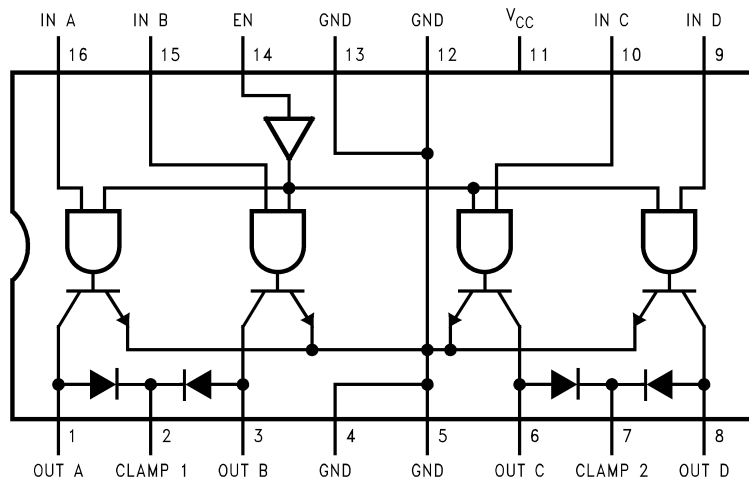


Figure 1. PDIP- Top View
See Package Number NFG0016E



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings ⁽¹⁾⁽²⁾

Supply Voltage	7V
Input Voltage	15V
Output Voltage	70V
Output Current	1.5A
Continuous Power Dissipation @ 25°C Free-Air ⁽³⁾	2075 mW
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 4 sec.)	260°C

- (1) "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be specified. They are not meant to imply that the device should be operated at these limits. [Electrical Characteristics](#) provides conditions for actual device operation.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
- (3) For operation over 25° free-air temperature, derate linearly to 1328 mW @ 70°C @ the rate of 16.6 mW/°C.

Operating Conditions

	Min	Max	Units
Supply Voltage	4.75	5.25	V
Ambient Temperature	0	70	°C

Electrical Characteristics⁽¹⁾⁽²⁾

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V _{IH}	Input High Voltage		2.0			V
V _{IL}	Input Low Voltage				0.8	V
I _{IH}	Input High Current	V _{IN} = 5.25V, V _{CC} = 5.25V		1.0	1.0	μA
I _{IL}	Input Low Current	V _{IN} = 0.4V			±10	μA
V _{IK}	Input Clamp Voltage	I _I = -12 mA		-0.8	-1.5	V
V _{OL}	Output Low Voltage	I _L = 300 mA		0.2	0.4	V
		I _L = 600 mA ⁽³⁾		0.35	0.7	V
I _{CEX}	Output Leakage Current	V _{CE} = 70V, V _{IN} = 0.8V			100	μA
V _F	Diode Forward Voltage	I _F = 800 mA		1.0	1.6	V
I _R	Diode Leakage Current	V _R = 70V			100	μA
I _{CC}	Supply Current	All Inputs High		60	85	mA
		All Inputs Low		2	4	mA

- (1) Unless otherwise specified, min/max limits apply across the 0°C to +70°C temperature range and the 4.75V to 5.25V power supply range. All typical values are for T_A = 25°C and V_{CC} = 5.0V.
- (2) All currents into device pins are shown as positive, all currents out of device pins are shown as negative, all voltages are referenced to ground, unless otherwise specified. All values shown as max or min are so classified on absolute value basis.
- (3) All sections of this quad circuit may conduct rated current simultaneously, however, power dissipation averaged over a short interval of time must fall within specified continuous dissipation ratings.

Switching Characteristics⁽¹⁾

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _{PHL}	Turn On Delay	R _L = 60Ω, V _L = 30V		226	500	ns
t _{PLH}	Turn Off Delay	R _L = 60Ω, V _L = 30V		2430	8000	ns

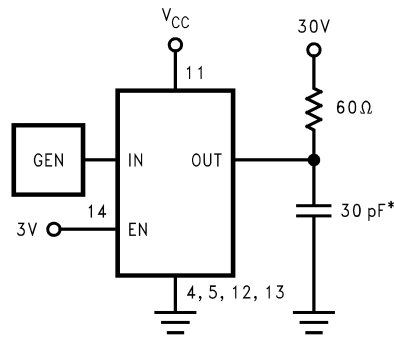
- (1) Unless otherwise specified, min/max limits apply across the 0°C to +70°C temperature range and the 4.75V to 5.25V power supply range. All typical values are for T_A = 25°C and V_{CC} = 5.0V.

Truth Table⁽¹⁾

IN	EN	OUT
H	H	L
L	H	Z
H	L	Z
L	L	Z

- (1) H = High state
 L = Low state
 Z = High impedance state

AC Test Circuit



*Includes probe and jig capacitance.

Figure 2.

Switching Waveforms

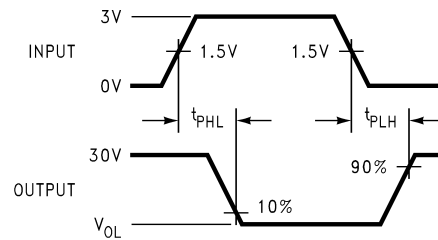
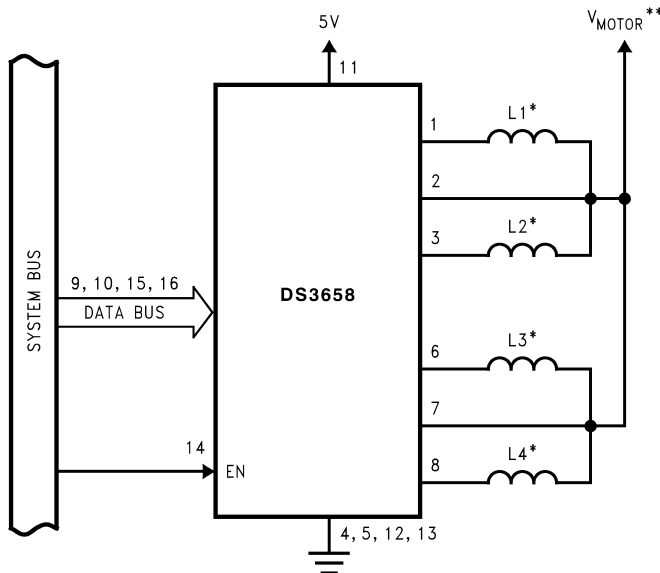


Figure 3.

Typical Applications



*L1, L2, L3, L4 are the windings of a bifilar stepping motor.
 **V_{MOTOR} is the supply voltage of the motor.

Figure 4. Stepping Motor Driver

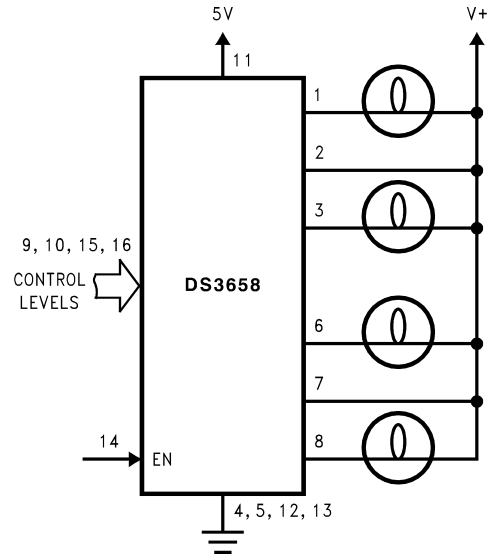


Figure 5. Lamp Driver

REVISION HISTORY

Changes from Revision A (April 2013) to Revision B	Page
<hr/> <ul style="list-style-type: none">• Changed layout of National Data Sheet to TI format <hr/>	<hr/> 4 <hr/>

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DS3658N	NRND	PDIP	NFG	16	25	TBD	Call TI	Call TI	0 to 70	DS3658N	
DS3658N/NOPB	ACTIVE	PDIP	NFG	16	25	Green (RoHS & no Sb/Br)	SN	Level-1-NA-UNLIM	0 to 70	DS3658N	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

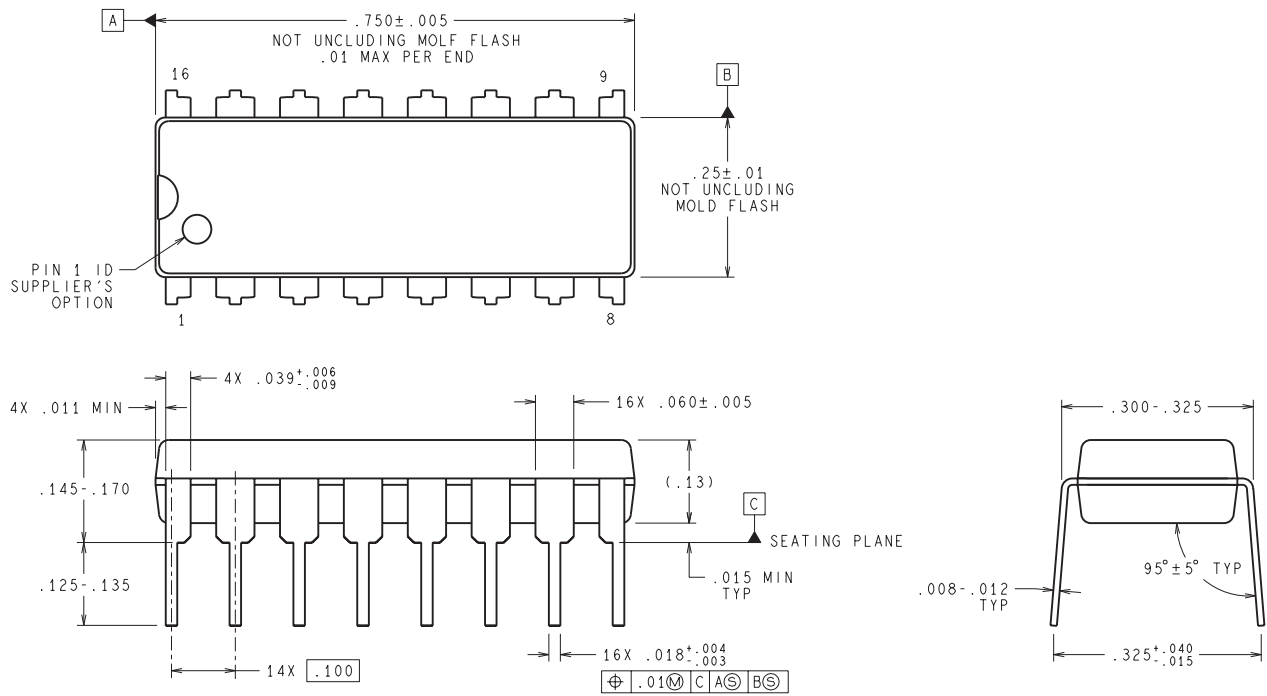
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

NFG0016E



DIMENSIONS ARE IN INCHES
 DIMENSIONS IN () FOR REFERENCE ONLY

N16E (Rev G)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com